B. Tech. Sem -VIII (E & TC Engg.) (2014 COURSE) (CBCS) : SUMMER - 2019

SUBJECT: ELECTIVE-II FUZZY LOGIC AND NEURAL NETWORK

Day: Thursday
Date: 30/05/2019

Time: 02.30 PM TO 05.30 PM
Max. Marks: 60

S-2019-2949

N.B:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Assume suitable data, if necessary.
4) Use of non-programmable **CALCULATOR** is allowed.

Q.1 Write short notes on: **(10)**

a) Applications of soft computing
b) Hybrid systems
c) Neuro-fuzzy and soft computing characteristics
d) Compare and contrast hard and soft computing
e) Evolutionary computation

OR

Q.1 **a)** Define a fuzzy set and explain the concept of a fuzzy number. What is the significance of fuzziness? **(06)**

b) Consider two fuzzy sets A and B find complement, Union, Intersection, Difference and De Morgan's laws. **(04)**

$$A=\left\{\frac{0.8}{2},\frac{0.4}{3},\frac{0.6}{4},\frac{0.1}{5},\frac{0.3}{6}\right\}$$

$$B=\left\{\frac{0.3}{2},\frac{0.8}{3},\frac{0.6}{4},\frac{0.8}{5},\frac{0.2}{6}\right\}$$

Q.2 **a)** Explain any four fuzzy membership functions with their transfer characteristics. **(06)**

b) Given a rule? If x is A, THEN y is B, **(04)**

where $A=\left\{\frac{0.2}{1},\frac{0.5}{2},\frac{0.7}{3}\right\}$ and $B=\left\{\frac{0.6}{5},\frac{0.8}{7},\frac{0.4}{9}\right\}$

Infer B' for another rule: If x is A', THEN y is B', where $A'=\left\{\frac{0.5}{1},\frac{0.9}{2},\frac{0.3}{3}\right\}$ using Mamdani Implication rule and max-min composition.

OR

Q.2 **a)** Describe the architecture of a Mamdani type Fuzzy Logic Controller and compare it with a conventional PID controller. **(06)**

b) What are the principal design parameters of a Fuzzy Logic Controller? Explain with a suitable example. **(04)**

Q.3 **a)** What are the advantages of Fuzzy Logic Controller over that of a conventional controller? **(06)**

b) Explain the Sugeno Fuzzy inference model with a suitable example. **(04)**

P.T.O.

OR

Q.3 **a)** Define the following terms with reference to fuzzy inference systems: **(06)**

i) Premise (Antecedent)
ii) Conclusion (Consequent)
iii) Rule-Base

b) Given two rules: **(04)**

Rule 1: If height is "TALL", then speed is "HIGH"
Rule 2: If height is "MEDIUM", then speed is "MODERATE"
The fuzzy sets for height (in feet) and speed (in m/s) are:

$$H_1 = "TALL" = \left\{\frac{0.5}{5}, \frac{0.8}{6}, \frac{1}{7}\right\}, S_1 = "HIGH" = \left\{\frac{0.4}{5}, \frac{0.7}{6}, \frac{0.9}{7}\right\}$$

$$H_2 = "\text{MEDIUM}" = \left\{\frac{0.6}{5}, \frac{0.7}{6}, \frac{0.6}{7}\right\}, S_2 = "\text{MODERATE}" = \left\{\frac{0.6}{5}, \frac{0.8}{7}, \frac{0.7}{9}\right\}$$

For a given $H_1 = "\text{ABOVE AVERAGE}" = \left\{\frac{0.5}{5}, \frac{0.9}{6}, \frac{0.8}{7}\right\}$

Compute $S' = "ABOVE\ NORMAL"$

Q.4 **a)** State the various learning rules in neural networks. **(06)**

b) Using Mc-Culloch Pitts neuron, implement a bipolar AND function. Assume initial weights to be [1 1]. **(04)**

OR

Q.4 **a)** What is a perceptron network? State the algorithm for perceptron learning. **(06)**

b) Train a perceptron network for learning a binary OR gate function. Work out two compete iterations. **(04)**

Q.5 **a)** Explain back-propagation algorithm for MLP with a neat signal flow graph. **(06)**

b) Enlist the various activations functions used in neural networks and explain any two in details. **(04)**

OR

Q.5 State the applications of artificial neural neural networks and explain any two in details. **(10)**

Q.6 **a)** Explain unsupervised learning mechanism in contrast with a supervised learning mechanism. **(06)**

b) Describe the self Organizing Map architecture and explain the Kohonen model. **(04)**

OR

Q.6 Write short notes on (**ANY TWO**): **(10)**

a) Architecture of ANFIS
b) Advantages of ANFIS over FIS
c) Use of ANN in process control

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